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~~DRAFT~~

QUALITY ASSURANCE PROJECT PLAN
OMEGA CHEMICAL SUPERFUND SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY OVERSIGHT

CALIFORNIA

EPA CONTRACT NO. 68-W-98-225
EPA WORK ASSIGNMENT NO. 174-RSBD-09BC
CH2M HILL PROJECT NO. 183120

Prepared for
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, California 94105

Prepared by
CH2M HILL
Southern California Regional Office
3 Hutton Centre Drive
Suite 200
Santa Ana, California 92707

~~October~~ January 200~~3~~

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NONDISCLOSURE STATEMENT

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U.S. ENVIRONMENTAL PROTECTION AGENCY REGION IX

Plan Title:	Draft Quality Assurance Project Plan Omega Chemical Superfund Site Remedial Investigation/Feasibility Study Oversight~~for South Indian Bend Wash – South Stage II, Phase 2 Remedial Investigation/Feasibility Study Oversight~~
Site Name:	Omega Chemical Superfund Site
Site Location:	Whittier
City/State/Zip:	~~California~~Los Angeles County, California
Site EPA ID#:	09BC
Anticipated Sampling Dates:	January 2004
Prepared By:	~~Artemis Antipas~~Tom Perina ~~October~~ January 200~~2003~~ Date
Agency or Firm:	CH2M HILL, Inc.
Address:	~~3 Hutton Centre Drive, Suite 200,~~164 West Hospitality Lane, Suite 2
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EPA Work Assignment Manager:	Christopher Lichens Section: SFD-7-4
Phone No.	415/972-3149
QAPP Approval Date:	_____

* *

Approved: Tom Perina, Ph.D., R.G., C.H.G. Tom Perina Date: ~~October~~ January, 200~~3~~4
CH2M HILL Site Manager

Approved: Artemis Antipas, Ph.D. Artemis Antipas Date: ~~October~~ January, 200~~3~~4
CH2M HILL Quality Assurance Officer

Approved: Christopher Lichens Date: _____
EPA Work Assignment Manager

Approved: _____ Date: _____
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_____ CH2M HILL Task Manager

_____ CH2M HILL Field Team Leader

_____ CH2M HILL QA Manager

Contents

Appendices

Tables

Figures

Acronyms

AL	action levels
AN	analytical support and data validation
AOC	administrative order on consent
ARAR	Applicable or Relevant and Appropriate Requirements
BOD	biological oxygen demand
CLP	contract laboratory program
COC	chain-of-custody
COD	chemical oxygen demand
Cr (VI)	hexavalent chromium
CRDL	contract required detection levels
DE	data evaluation
DHS	Department of Health Services
DQO	data quality objectives
EC	electrical conductivity
EE/CA	engineering evaluation/corrective action
EPA	Environmental Protection Agency
ERA	ecological risk assessment
FAR	Federal Acquisition Regulations
FSP	field sampling plan
GAC	granular activated carbon
GC	gas chromatography
GIS	geographic information system
HHRA	human health risk assessment
HSP	health and safety plan
IBW	Indian Bend Wash
IMC	IMC Magnetics
LOE	level of effort
MAU	middle alluvial unit

MCL	maximum containment level
MDL	method detection limit
µg/L	micrograms per liter
MNA	monitored natural attenuation
MP	multiport
MS	matrix spike; mass spectroscopy
MS/MSD	matrix spike/matrix spike duplicate
MSD	matrix spike duplicate
msL	mean sea level
MTBE	methyltributylethylene
NDMA	n-nitrosodimethylamine
NPL	National Priorities List
OPOG	Omega Chemical Site Potentially Responsible Party Organized Group
OU	operable unit
PCE	perchloroethylene (tetrachloroethene)
PHG	public health goal
PRP	potentially responsible party
QA/QC	quality assurance/quality control
QAO	quality assurance officer
QAPP	quality assurance project plan
RA	remedial action
RAC	response action contract
RD	remedial design
RFA	request for analyses
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RPD	relative percent difference
RPM	remedial project manager
RSCC	Regional Sample Control Center
RSD	relative standard deviation
RTL	review team leader
SIBW	South Indian Bend Wash

SM	site manager
SOW	statement of work
SRM	standard reference material
SSC	site safety coordinator
STL	sampling team leader
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCA	1,1,1-trichloroethane
TCE	trichloroethylene (trichloroethene)
TCL	Target Compound List
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TPH	total petroleum hydrocarbon
UAU	upper alluvial unit
VOC	volatile organic compound
WA	work assignment
WAM	work assignment manager

Introduction

This Quality Assurance Project Plan (QAPP) follows EPA guidelines contained in *EPA Guidance for Quality Assurance Project Plans* (EPA, 1998), *EPA Requirements for Quality Assurance Project Plans* (EPA, ~~1999~~ March 2001). Thus, the following section headings correlate with the subtitles found in the EPA guidelines (EPA, ~~1998~~ December 2002).

Section A
Project Management/Data Quality Objectives

A.1 Project Organization

This work assignment issued under Environmental Protection Agency (EPA) Response Action Contract (RAC) Assignment No. 174-RSBD-09BC has a site manager (SM) who works directly with the EPA work assignment manager (WAM) to accomplish the work assignment. The SM will manage the financial, schedule, and technical status of the work assignment. The key people involved in interfacing with the SM are the WAM, quality assurance officer (QAO), senior reviewer/review team leader (RTL), and individual task managers for field sampling (sampling team leader, or STL).

The primary responsibility for project quality rests with the SM, independent quality control is provided by the RTL and QAO. The RTL/review team and QAO will review project planning documents, data evaluation, and deliverables.

The sampling team will implement the QAPP/field sampling plan (FSP)/health and safety plan (HSP). The site safety coordinator (SSC) is responsible for adherence to the HSP and field decontamination procedures. The entire field effort is directed by the STL.

The subcontract administrator is responsible for procuring subcontracts for EPA's RAC projects under Federal Acquisition Regulations (FAR), and provides the interface with subcontractors. Subcontractors may be utilized on this work assignment for laboratory analyses depending on EPA regional laboratory availability.

Where quality assurance problems or deficiencies requiring special action are uncovered, the SM, RTL, and QAO will identify the appropriate corrective action to be initiated by the STL or the laboratory.

Project organization and the line of authority for CH2M HILL efforts are illustrated in Figure A-1. Data users and recipients are shown in Figure A-2. Both EPA and CH2M HILL technical personnel and quality assurance personnel are shown.

The organizational functions noted above are consistent with the overall RAC IX Program Plan, and these functions are further detailed in the program plan.

A.2 Problem Definition/Background

A.2.1 Purpose

This QAPP presents the policies, organizations, objectives, and functional activities/procedures associated with the remedial investigation sampling and analysis activities at Omega Chemical Superfund Site and accompanies the data quality objectives (DQO) which can be found in Appendix A (EPA, 1994 and 2000).

This QAPP follows EPA guidelines contained in *EPA Guidance for Quality Assurance Project Plans* (EPA, 1998), *EPA Requirements for Quality Assurance Project Plans* (EPA, 1999). Thus, the following section headings correlate with the subtitles found in the EPA guidelines (EPA, 1998).

A.2.2 Problem Statement

Quality assurance through split sample analyses is needed for oversight of the Remedial Investigation/Feasibility Study at Omega Chemical Superfund site, Operable Unit 01 conducted by Omega Chemical Site Potentially Responsible Party Organized Group (OPOG).

A.2.3 Background

Existing groundwater and soil data indicate elevated concentrations of volatile organic compounds (VOCs) are present the soil and groundwater beneath the former Omega Chemical Facility. A series of soil gas, soil, and groundwater investigations have been performed at the site by a variety of consultants beginning in 1985. Chlorinated hydrocarbons (primarily perchloroethylene [PCE], trichloroethylene [TCE], 1,1-dichloroethene [1,1-DCE], cis-1,2-dichloroethene [cis-1,2-DCE], and chloroform) and Freons (Freon 11 and Freon 113) are the primary chemicals of concern directly beneath the site. Elevated total chromium was also found in groundwater beneath the site. These chemicals could potentially have an adverse effect upon human health and the environment.

As part of the OU-1 effort, EPA entered into a Partial Consent Decree with OPOG. This Partial Consent Decree was entered into the District Court on February 23, 2001 and OPOG agreed to perform the following work at the Site:

1) Implement a remedial investigation/feasibility study (RI/FS) for contamination in the vadose zone within what is known as the "Phase 1A area" of the Site;

2) Perform an engineering evaluation/corrective action (EE/CA) addressing groundwater contamination in the Phase 1A area;

3) Implement the response action selected in EPA's Action Memorandum at the conclusion of the EE/CA (which is expected to be a groundwater treatment system, e.g. pump and treat, located at the downgradient edge of the Phase 1A area);

4) Perform a risk assessment for potential contamination resulting from releases of hazardous substances from the Omega Property within the Phase 1A area; and

5) Install up to three groundwater monitoring wells at locations downgradient of the Phase 1A area and upgradient of the City of Santa Fe Springs water supply well 30R3.

As related to the DQOs, CH2M HILL will perform oversight of OPOG as they:

(a) Collect additional groundwater data (to be collected from existing wells), as well as data from surface and subsurface soil, soil gas, and ambient air samples. These data are needed to update the past assessment of the nature and extent of VOC contamination.

(b) Perform risk evaluations of contaminated media at the site and their possible impact to receptors.

(c) Perform modeling of the fate and transport of contaminants at the site.

(d) Determine whether remedial action is necessary at the site and possibly perform pilot and/or bench testing.

A.2.4 Data Needs and Uses

Data needs and uses for the objectives described in this section have been identified through the DQO process presented in Appendix A. The data needs and uses are summarized in Tables A-1a to A-1c ~~A-1~~. Tables A-1a to A-1c lists the analytes of concern and presents regulatory criteria/action level requirements for organics and inorganics. The table presents a listing of applicable regulations and identifies the lowest regulatory criteria where there are multiple regulatory criteria/action levels for a given analyte for the OPOG data. For this project the criteria needs to be at least as low as the OPOG data since the two sets will be compared. Thus the OPOG regulatory limits were taken into consideration in selecting appropriate methods and laboratory reporting levels as described in Section A.4.2. Table A-2 lists the analytical methods and laboratory reporting limits selected to meet these criteria.

A.3 Project Description and Schedule

A.3.1 Description of Work to be Performed

A summary of the work to be performed relating to sample collection, analysis, and interpretation follows below:

Field Investigation

CH2M HILL will conduct oversight of the RI/FS field investigation and collect split environmental samples and information required in support of the RI/FS oversight. The splits will include surface and subsurface soil samples, groundwater samples, soil gas samples, ambient air samples, and associated field duplicates.

Sample Analysis

CH2M HILL will arrange for a contract laboratory program (CLP) type sample analysis of split environmental samples collected during the previous task.

Analytical Support and Data Validation

~~CH2M HILL will perform the validation of the split samples to ensure that adequate and definable sample management and techniques are implemented.~~ All data for all parameters will undergo two levels of review and validation: 1) at the laboratory, and 2) outside the laboratory by the EPA quality assurance management section or their designee. One hundred percent of data will be reviewed outside the laboratory at EPA Region IX Tier 3 level of effort (detailed in section D).

Data Evaluation

CH2M HILL will organize and evaluate data gathered during the previous tasks. The data evaluation activities will include:

- Data Usability Evaluation and Field Quality Assurance/Quality Control (QA/QC)
- Data Reduction, Tabulation, and Evaluation
- Review of OPOG's Modeling
- Develop Data Evaluation Report

CH2M HILL will review OPOG's hydrogeological modeling and perform modeling simulations, as directed by EPA, to evaluate OPOG's conclusions regarding the fate and transport of contaminants at the site. CH2M HILL will summarize the results of the data evaluation and review OPOG's hydrogeological modeling in a data evaluation report.

Assessment of Risk

CH2M HILL will review and provide comment on the OPOG's evaluation and assessment of risk to human health and the environment posed by site contaminants. The OPOG's assessment shall:

- Determine if site contaminants pose a current or potential risk to human health and the environment in the absence of any remedial action.
- Address the contaminant identification, exposure assessment, toxicity assessment, and risk characterization.
- Determine if a remedial action is necessary at the site, provide justification for performing remedial action, and determine what exposure pathways need to be removed.

CH2M HILL will review and comment on the OPOG's Human Health Risk Assessment (HHRA) report that addresses the following:

- Hazard Identification (sources)
- Dose-Response Assessment
- Prepare Conceptual Exposure/Pathway Analysis
- Characterization of Site and Potential Receptors
- Exposure Assessment
- Risk Characterization
- Identification of Limitations/Uncertainties
- Site Conceptual Model

CH2M HILL will review and comment on the OPOG's Ecological Risk Assessment (ERA) report that addresses the following:

- Hazard Identification (sources)
- Dose-Response Assessment
- Prepare Conceptual Exposure/Pathway Analysis
- Critical exposure pathways (e.g., surface water)
- Characterization of Site and Potential Receptors
- Select Chemicals, Indicator Species, and End Points
- Exposure Assessment
- Toxicity Assessment/Ecological Effects Assessment
- Risk Characterization
- Identification of Limitations/Uncertainties

- Site Conceptual Model

Treatability Study/Pilot Testing

CH2M HILL will review and comment on treatability studies and/or pilot tests conducted by the OPOG's as directed by EPA to ensure successful completion of the RI/FS and remedy selection process. The review will further ensure that the OPOG clearly states the rationale for a treatability study or pilot test in their work plan and that they conduct the treatability study or pilot test in accordance with the Fact Sheet "Guide for Conducting Treatability Studies Under CERCLA," November, 1993.

CH2M HILL will review the OPOG literature search and work plan.

CH2M HILL will collect split samples for analysis and comparison with the OPOG's data during bench tests, pilot studies, and field tests.

CH2M HILL will review the OPOG's Treatability Study Report and provide comments after receipt of the Treatability Study. The review will focus on the performance of the technology; the test results compared with reported technology performance standards; treatment technology's effectiveness, implementability, cost, and final results compared with the predicted results; and also an evaluation of a full-scale application of the technology, including a sensitivity analysis identifying the key parameters affecting full-scale operation.

Remedial Investigation Report

CH2M HILL will review the OPOG's RI report to ensure that the report accurately establishes the site characteristics such as media contaminated, extent of contamination, and the physical boundaries of the contamination.

A.3.2 Schedule of Activities

The field investigation is expected to last approximately 3 weeks after mobilization, the split sampling will be spread over this time frame.

A.4 Data Quality Objectives

A.4.1 Project Quality Objectives

The specific needs for data that will be collected during each activity were examined to evaluate whether project objectives for the remedial investigation are optimally achieved. Specific DQOs were considered independently through the DQO process (EPA Q4/G4, 1994~~b~~ and 2000) to meet the data user's needs for each activity. Appendix A presents the DQO decision-making process for the remedial field activities.

A.4.2 Measurement Performance Criteria

The QA objective of this plan is to develop implementation procedures that will provide data of known and appropriate quality for the needs identified in previous sections. Data quality is assessed by representativeness, comparability, accuracy, precision, and completeness. These terms, the applicable procedures, and level of effort are described below.

The applicable QC procedures, quantitative target limits, and level of effort for assessing data quality are dictated by the intended use of the data and the nature of the analytical methods. Analytical parameters and applicable detection levels, analytical precision, accuracy, and completeness in alignment with needs identified in Section A-2.4 are presented in Table A-2.

Reporting detection levels/target detection limits listed in Table A-2 are per method reporting limits, equivalent to contract required detection levels (CRDLs). Target implies that final sample detection levels may be higher because of sample matrix effects. Detection levels for the individual samples will be reported in the final data. Laboratory specific method detection levels (MDLs) are significantly below reporting levels. Where reporting limits are higher than regulatory limits, the project team will use MDLs as needed for project decisions. This is not expected to impact project decisions.

Representativeness is a measure of how closely the results reflect the actual concentration or distribution of the chemical compounds in the matrix samples. Sampling plan design, sampling techniques, and sample-handling protocols (e.g., for storage, preservation, and transportation) have been developed, and are discussed in subsequent sections of this document. The proposed documentation will establish that protocols have been followed and sample identification and integrity ensured.

Comparability expresses the confidence with which one data set can be compared to another. Data comparability will be maintained using defined procedures and the use of consistent methods and consistent units. Actual detection limits will depend on the sample matrix and will be reported as defined for the specific samples.

Accuracy is an assessment of the closeness of the measured value to the true value. For samples, accuracy of chemical test results is assessed by spiking samples with known standards and establishing the average recovery. For a matrix spike, known amounts of a standard compound identical to the compounds being measured are added to the sample. A quantitative definition of average recovery accuracy is given in Section D.3. The level of effort (LOE) for accuracy measurements will be a minimum frequency of 1 in 20 samples analyzed.

Precision is a measure of the data spread when more than one measurement has been collected from the same sample. Precision can be expressed as the relative percent difference; a quantitative definition is given in Section D.3. The LOE for precision measurements will be a minimum of 1 in 20 samples analyzed.

Completeness is a measure of the amount of valid data obtained from the analytical measurement system and the complete implementation of defined field procedures. The quantitative definition of completeness is given in Section D.3. The target completeness objective will be 90 percent; the actual completeness may vary depending on the intrinsic nature of the samples. The completeness of the data will be assessed during QC reviews.

A.5 Special Training Requirements/Certification (A8)

All project staff working on the site will be health and safety trained, and will follow requirements specified in the project's Health and Safety Plan (HSP), which can be found in

the companion FSP (EPA, 2003). The HSP describes the specialized training required for personnel on this project and the documentation and tracking of this training.

A.6 Documentation and Records

Field documentation and records will be as described in Section B and the FSP. Laboratory documentation will be per: (1) methods and quality assurance protocols listed in Section B, and (2) EPA Regional Laboratory specific standard operating procedures. Overall project documentation will be per EPA's Region IX RAC Program Plan.

TABLE A-1a
Data Uses and Needs – Soils

Parameter	Data Use	Regulatory Limit/ Action Level (mg/kg)[1]	Laboratory Target Reporting Limit (mg/kg)[2]
CAM Metals			
Antimony	Comparison to OPOG data	31	10.0
Arsenic – Method 6020	Comparison to OPOG data	0.39	0.5
Barium	Comparison to OPOG data	5,375	1.0
Beryllium	Comparison to OPOG data	154	1.0
Cadmium	Comparison to OPOG data	37	0.50
Chromium	Comparison to OPOG data	100,000	20
Cobalt	Comparison to OPOG data	4,692	10.0
Copper	Comparison to OPOG data	2,905	2.0
Lead	Comparison to OPOG data	400	10.0
Mercury – Method 7471A	Comparison to OPOG data	23	0.10
Molybdenum	Comparison to OPOG data	391	3.0
Nickel	Comparison to OPOG data	1,564	2.0
Selenium	Comparison to OPOG data	391	3.0
Silver	Comparison to OPOG data	391	1.0
Thallium	Comparison to OPOG data	5.2	6.0
Vanadium	Comparison to OPOG data	547	1.0
Zinc	Comparison to OPOG data	23,463	1.0
Volatile Organic Compounds			
Acetone	Comparison to OPOG data	1,444	0.010
Benzene	Comparison to OPOG data	0.62	0.002
Bromobenzene	Comparison to OPOG data	28.1	0.005
Bromochloromethane	Comparison to OPOG data	—	0.0005
Bromodichloromethane	Comparison to OPOG data	0.98	0.002
Bromoform	Comparison to OPOG data	56.2	0.005
Bromomethane	Comparison to OPOG data	3.84	0.005
n-Butylbenzene	Comparison to OPOG data	134	0.005
sec-Butylbenzene	Comparison to OPOG data	105	0.005
tert-Butylbenzene	Comparison to OPOG data	122	0.005
Carbon tetrachloride	Comparison to OPOG data	0.23	0.005
Chlorobenzene	Comparison to OPOG data	53.8	0.002
Chloroethane	Comparison to OPOG data	1,600	0.005
Chloroform	Comparison to OPOG data	0.24	0.002
Chloromethane	Comparison to OPOG data	1.21	0.005
2-Chlorotoluene	Comparison to OPOG data	152	0.005
4-Chlorotoluene	Comparison to OPOG data	—	0.005
Dibromochloromethane	Comparison to OPOG data	5.28	0.002
1,2-Dibromo-3-chloropropane	Comparison to OPOG data	0.32	0.005

TABLE A-1a
Data Uses and Needs – Soils

Parameter	Data Use	Regulatory Limit/ Action Level (mg/kg)[1]	Laboratory Target Reporting Limit (mg/kg)[2]
1,2-Dibromoethane	Comparison to OPOG data	0.0049	0.002
Dibromomethane	Comparison to OPOG data	545	0.002
1,2-Dichlorobenzene	Comparison to OPOG data	370	0.002
1,3-Dichlorobenzene	Comparison to OPOG data	40.6	0.002
1,4-Dichlorobenzene	Comparison to OPOG data	3.03	0.002
Dichlorodifluoromethane (Freon 12)	Comparison to OPOG data	93.6	0.005
1,1-Dichloroethane	Comparison to OPOG data	571	0.002
1,2-Dichloroethane	Comparison to OPOG data	0.34	0.002
1,1-Dichloroethene	Comparison to OPOG data	0.052	0.005
cis-1,2-Dichloroethene	Comparison to OPOG data	41.9	0.002
trans-1,2-Dichloroethene	Comparison to OPOG data	62.1	0.002
1,2-Dichloropropane	Comparison to OPOG data	0.34	0.002
1,3-Dichloropropane	Comparison to OPOG data	—	0.002
2,2-Dichloropropane	Comparison to OPOG data	—	0.002
1,1-Dichloropropene	Comparison to OPOG data	—	0.002
cis-1,3-Dichloropropene	Comparison to OPOG data	0.081	0.002
trans-1,3-Dichloropropene	Comparison to OPOG data	0.081	0.002
Ethylbenzene	Comparison to OPOG data	230	0.002
Hexachlorobutadiene	Comparison to OPOG data	5.69	0.005
Isopropylbenzene	Comparison to OPOG data	156	0.002
p-Isopropyltoluene	Comparison to OPOG data	—	0.002
Methylene chloride	Comparison to OPOG data	8.49	0.020
Methyl tert-butyl ether	Comparison to OPOG data	—	0.005
Naphthalene	Comparison to OPOG data	54.8	0.005
n-Propylbenzene	Comparison to OPOG data	134	0.002
Styrene	Comparison to OPOG data	1,700	0.002
1,1,1,2-Tetrachloroethane	Comparison to OPOG data	2.85	0.005
1,1,2,2-Tetrachloroethane	Comparison to OPOG data	0.36	0.002
Tetrachloroethene	Comparison to OPOG data	4.72	0.002
Toluene	Comparison to OPOG data	520	0.002
1,2,3-Trichlorobenzene	Comparison to OPOG data	—	0.005
1,2,4-Trichlorobenzene	Comparison to OPOG data	475	0.005
1,1,1-Trichloroethane	Comparison to OPOG data	685	0.002
1,1,2-Trichloroethane	Comparison to OPOG data	0.815	0.002
Trichloroethene	Comparison to OPOG data	2.71	0.002
Trichlorofluoromethane (Freon 11)	Comparison to OPOG data	383	0.005
1,2,3-Trichloropropane	Comparison to OPOG data	0.0014	0.010

TABLE A-1a
Data Uses and Needs – Soils

Parameter	Data Use	Regulatory Limit/ Action Level (mg/kg)[1]	Laboratory Target Reporting Limit (mg/kg)[2]
Trichlorotrifluoroethane (Freon 113)	Comparison to OPOG data	5,600	0.005
1,2,4-Trimethylbenzene	Comparison to OPOG data	51.3	0.002
1,3,5-Trimethylbenzene	Comparison to OPOG data	21.2	0.002
Vinyl chloride	Comparison to OPOG data	0.021	0.005
o-Xylene	Comparison to OPOG data	210	0.002
m,p-Xylenes	Comparison to OPOG data	280	0.002
Semi-volatile Organic Compounds			
Base/Neutral Extractables			
1,2,4-Trichlorobenzene	Comparison to OPOG data	646	0.7
1,2-Dichlorobenzene	Comparison to OPOG data	370	0.7
1,3-Dichlorobenzene	Comparison to OPOG data	13	0.7
1,4-Dichlorobenzene	Comparison to OPOG data	3.4	0.7
2,4-Dinitrotoluene	Comparison to OPOG data	0.71	0.7
2,6-Dinitrotoluene	Comparison to OPOG data	0.71	0.7
2-Chloronaphthalene	Comparison to OPOG data	3,852	0.7
2-Methylnaphthalene	Comparison to OPOG data	—	0.7
2-Nitroaniline	Comparison to OPOG data	3.5	3.3
3-Nitroaniline	Comparison to OPOG data	—	3.3
3,3'-Dichlorobenzidine	Comparison to OPOG data	1.1	1.3
4-Bromophenyl phenyl ether	Comparison to OPOG data	—	0.7
4-Chloroaniline	Comparison to OPOG data	244	1.3
4-Chlorophenyl phenyl ether	Comparison to OPOG data	—	0.7
4-Nitroaniline	Comparison to OPOG data	—	3.3
Acenaphthylene	Comparison to OPOG data	3,681	0.7
Acenaphthene	Comparison to OPOG data	3,681	0.7
Anthracene	Comparison to OPOG data	21,896	0.7
Benz(a)anthracene	Comparison to OPOG data	0.62	0.7
Benzo(a)pyrene	Comparison to OPOG data	0.062	0.7
Benzo(b)fluoranthene	Comparison to OPOG data	0.62	0.7
Benzo(g,h,I)perylene	Comparison to OPOG data	—	0.7
Benzl alcohol	Comparison to OPOG data	18,330	1.3
Bis(2-chloroethoxy)methane	Comparison to OPOG data	—	0.7
Bis(2-chloroethyl)ether	Comparison to OPOG data	0.21	0.7
Bis(2-chloroisopropyl)ether	Comparison to OPOG data	2.9	0.7
Bis(2-ethylhexyl)phthalate	Comparison to OPOG data	35	0.7
Butyl benzylphthalate	Comparison to OPOG data	12,220	0.7
Chrysene	Comparison to OPOG data	62	0.7

TABLE A-1a
Data Uses and Needs – Soils

Parameter	Data Use	Regulatory Limit/ Action Level (mg/kg)[1]	Laboratory Target Reporting Limit (mg/kg)[2]
Di-n-butylphthalate	Comparison to OPOG data	6,110	0.7
Di-n-octylphthalate	Comparison to OPOG data	1,222	0.7
Dibenz(a,h)anthracene	Comparison to OPOG data	0.062	0.7
Dibenzofuran	Comparison to OPOG data	290	0.7
Diethyl phthalate	Comparison to OPOG data	48,882	0.7
Dimethyl phthalate	Comparison to OPOG data	100,000	0.7
Fluoranthene	Comparison to OPOG data	2,293	0.7
Fluorene	Comparison to OPOG data	2,643	0.7
Hexachlorobenzene	Comparison to OPOG data	0.30	0.7
Hexachlorobutadiene	Comparison to OPOG data	6.2	0.7
Hexachlorocyclopentadiene	Comparison to OPOG data	423	0.7
Hexachloroethane	Comparison to OPOG data	35	0.7
Indeno(1,2,3-cd)pyrene	Comparison to OPOG data	0.62	0.7
Isophorone	Comparison to OPOG data	511	0.7
n-Nitrosodiphenylamine	Comparison to OPOG data	99	0.7
n-Nitrosodi-n-propylamine	Comparison to OPOG data	0.069	0.7
Naphthalene	Comparison to OPOG data	56	0.7
Nitrobenzene	Comparison to OPOG data	20	0.7
Phenanthrene	Comparison to OPOG data	—	0.7
Pyrene	Comparison to OPOG data	2,308	0.7
SVOCs: Acid Extractables			
2,4,5-Trichlorophenol	Comparison to OPOG data	6,110	3.3
2,4,6-Trichlorophenol	Comparison to OPOG data	44	0.3
2,4-Dichlorophenol	Comparison to OPOG data	183	0.3
2,4-Dimethylphenol	Comparison to OPOG data	1,222	0.3
2,4-Dinitrophenol	Comparison to OPOG data	122	3.3
2-Chlorophenol	Comparison to OPOG data	63	0.3
2-Methylphenol	Comparison to OPOG data	3,055	0.3
2-Nitrophenol	Comparison to OPOG data	—	0.3
4,6-Dinitro-2-methylphenol	Comparison to OPOG data	—	3.3
4-Chloro-3-methylphenol	Comparison to OPOG data	—	1.3
4-Methylphenol	Comparison to OPOG data	305	0.3
4-Nitrophenol	Comparison to OPOG data	488	1.6
Benzoic Acid	Comparison to OPOG data	100,000	1.6
Pentachlorophenol	Comparison to OPOG data	3.0	3.3
Phenol	Comparison to OPOG data	36,661	0.3
Pesticides and Polychlorinated Biphenyls			
Organochlorine Pesticides –8081A			

TABLE A-1a
Data Uses and Needs – Soils

Parameter	Data Use	Regulatory Limit/ Action Level (mg/kg)[1]	Laboratory Target Reporting Limit (mg/kg)[2]
α-BHC	Comparison to OPOG data	0.09	0.019
β-BHC	Comparison to OPOG data	0.32	0.033
δ-BHC	Comparison to OPOG data	—	0.011
γ-BHC (Lindane)	Comparison to OPOG data	0.44	0.020
α-Chlordane	Comparison to OPOG data	1.6	0.015
γ-Chlordane	Comparison to OPOG data	1.6	0.015
4,4'-DDD	Comparison to OPOG data	2.4	0.042
4,4'-DDE	Comparison to OPOG data	1.7	0.025
4,4'-DDT	Comparison to OPOG data	1.7	0.036
Aldrin	Comparison to OPOG data	0.029	0.022
Dieldrin	Comparison to OPOG data	0.03	0.035
Endosulfan I	Comparison to OPOG data	366	0.021
Endosulfan II	Comparison to OPOG data	366	0.024
Endosulfan Sulfate	Comparison to OPOG data	—	0.036
Endrin	Comparison to OPOG data	18	0.036
Endrin Aldehyde	Comparison to OPOG data	—	0.016
Heptachlor	Comparison to OPOG data	0.11	0.020
Heptachlor Epoxide	Comparison to OPOG data	0.053	0.021
Methoxychlor	Comparison to OPOG data	305	0.057
Toxaphene	Comparison to OPOG data	0.44	0.57
Polychlorinated Biphenyls – 8082			
PCB-1016	Comparison to OPOG data	3.9	0.70
PCB-1221	Comparison to OPOG data	0.22	0.70
PCB-1232	Comparison to OPOG data	0.22	0.70
PCB-1242	Comparison to OPOG data	0.22	0.70
PCB-1248	Comparison to OPOG data	0.22	0.70
PCB-1254	Comparison to OPOG data	0.22	0.70
PCB-1260	Comparison to OPOG data	0.22	0.70

Notes:
[1]EPA Region IX Preliminary Remediation Goals (PRGs) for residential soils.
[2]Reporting Limits (RLs) shown are for samples that have not been diluted. RLs are matrix dependent and may be higher or lower than listed.
— No Standard

TABLE A-1b
Data Uses and Needs – Soil Gas and Air

Parameter	Data Use	Regulatory Limit/ Action Level	Laboratory Target Reporting Limit (ppb (v/v))[1]
Volatile Organic Compounds ~~—Soils~~			
Acetone	Comparison to OPOG data	N/A	10
Benzene	Comparison to OPOG data	N/A	2.0
Bromobenzene	Comparison to OPOG data	N/A	NT
Bromochloromethane	Comparison to OPOG data	N/A	NT
Bromodichloromethane	Comparison to OPOG data	N/A	2.0
Bromoform	Comparison to OPOG data	N/A	2.0
Bromomethane	Comparison to OPOG data	N/A	2.0
n-Butylbenzene	Comparison to OPOG data	N/A	NT
sec-Butylbenzene	Comparison to OPOG data	N/A	NT
tert-Butylbenzene	Comparison to OPOG data	N/A	NT
Carbon tetrachloride	Comparison to OPOG data	N/A	2.0
Chlorobenzene	Comparison to OPOG data	N/A	2.0
Chloroethane	Comparison to OPOG data	N/A	4.0
Chloroform	Comparison to OPOG data	N/A	2.0
Chloromethane	Comparison to OPOG data	N/A	4.0
2-Chlorotoluene	Comparison to OPOG data	N/A	NT
4-Chlorotoluene	Comparison to OPOG data	N/A	NT
Dibromochloromethane	Comparison to OPOG data	N/A	2.0
1,2-Dibromo-3-chloropropane	Comparison to OPOG data	N/A	NT
1,2-Dibromoethane	Comparison to OPOG data	N/A	2.0
Dibromomethane	Comparison to OPOG data	N/A	NT
1,2-Dichlorobenzene	Comparison to OPOG data	N/A	2.0
1,3-Dichlorobenzene	Comparison to OPOG data	N/A	NT
1,4-Dichlorobenzene	Comparison to OPOG data	N/A	2.0
Dichlorodifluoromethane (Freon 12)	Comparison to OPOG data	N/A	2.0
1,1-Dichloroethane	Comparison to OPOG data	N/A	2.0
1,2-Dichloroethane	Comparison to OPOG data	N/A	2.0
1,1-Dichloroethene	Comparison to OPOG data	N/A	2.0
cis-1,2-Dichloroethene	Comparison to OPOG data	N/A	2.0
trans-1,2-Dichloroethene	Comparison to OPOG data	N/A	2.0
1,2-Dichloropropane	Comparison to OPOG data	N/A	2.0
1,3-Dichloropropane	Comparison to OPOG data	N/A	NT
2,2-Dichloropropane	Comparison to OPOG data	N/A	NT
1,1-Dichloropropene	Comparison to OPOG data	N/A	NT
cis-1,3-Dichloropropene	Comparison to OPOG data	N/A	2.0

TABLE A-1b
Data Uses and Needs – Soil Gas and Air

Parameter	Data Use	Regulatory Limit/ Action Level	Laboratory Target Reporting Limit (ppb (v/v))[1]
trans-1,3-Dichloropropene	Comparison to OPOG data	N/A	2.0
Ethylbenzene	Comparison to OPOG data	N/A	2.0
Hexachlorobutadiene	Comparison to OPOG data	N/A	4.0
Isopropylbenzene	Comparison to OPOG data	N/A	NT
p-Isopropyltoluene	Comparison to OPOG data	N/A	NT
Methylene chloride	Comparison to OPOG data	N/A	2.0
Methyl tert-butyl ether	Comparison to OPOG data	N/A	NT
Naphthalene	Comparison to OPOG data	N/A	NT
n-Propylbenzene	Comparison to OPOG data	N/A	NT
Styrene	Comparison to OPOG data	N/A	2.0
1,1,1,2-Tetrachloroethane	Comparison to OPOG data	N/A	NT
1,1,2,2-Tetrachloroethane	Comparison to OPOG data	N/A	2.0
Tetrachloroethene	Comparison to OPOG data	N/A	2.0
Toluene	Comparison to OPOG data	N/A	2.0
1,2,3-Trichlorobenzene	Comparison to OPOG data	N/A	NT
1,2,4-Trichlorobenzene	Comparison to OPOG data	N/A	2.0
1,1,1-Trichloroethane	Comparison to OPOG data	N/A	2.0
1,1,2-Trichloroethane	Comparison to OPOG data	N/A	2.0
Trichloroethene	Comparison to OPOG data	N/A	2.0
Trichlorofluoromethane (Freon 11)	Comparison to OPOG data	N/A	2.0
1,2,3-Trichloropropane	Comparison to OPOG data	N/A	NT
Trichlorotrifluoroethane (Freon 113)	Comparison to OPOG data	N/A	2.0
1,2,4-Trimethylbenzene	Comparison to OPOG data	N/A	2.0
1,3,5-Trimethylbenzene	Comparison to OPOG data	N/A	2.0
Vinyl chloride	Comparison to OPOG data	N/A	2.0
o-Xylene	Comparison to OPOG data	N/A	2.0
m,p-Xylenes	Comparison to OPOG data	N/A	2.0

Notes:
[1]Reporting Limits (RLs) shown are for samples that have not been diluted. RLs are matrix dependent and may be higher or lower than listed.

N/A – Not applicable
NT – Not a target analyte

TABLE A-1c
Data Uses and Needs – GroundWwater

Parameter	Data Use	Regulatory Limit/ Action Level (µg/L)[1]	Laboratory Target Reporting Limit (µg/L)[2]
Volatile Organic Compounds ~~(Equipment Rinsate Blanks)~~			
Acetone	Comparison to OPOG data	—	10
Benzene	Comparison to OPOG data	1	0.50
Bromobenzene	Comparison to OPOG data	—	1.0
Bromochloromethane	Comparison to OPOG data	—	1.0
Bromodichloromethane	Comparison to OPOG data	100[3~~(A)~~]	1.0
Bromoform	Comparison to OPOG data	100[3~~(A)~~]	1.0
Bromomethane	Comparison to OPOG data	—	1.0
n-Butylbenzene	Comparison to OPOG data	—	1.0
sec-Butylbenzene	Comparison to OPOG data	—	0.50
tert-Butylbenzene	Comparison to OPOG data	—	1.0
Carbon tetrachloride	Comparison to OPOG data	0.5	0.50
Chlorobenzene	Comparison to OPOG data	70	1.0
Chloroethane	Comparison to OPOG data	—	1.0
Chloroform	Comparison to OPOG data	100[3~~(A)~~]	1.0
Chloromethane	Comparison to OPOG data	—	1.0
2-Chlorotoluene	Comparison to OPOG data	—	1.0
4-Chlorotoluene	Comparison to OPOG data	—	1.0
Dibromochloromethane	Comparison to OPOG data	100[3~~(A)~~]	1.0
1,2-Dibromo-3-chloropropane	Comparison to OPOG data	0.2	5.0
1,2-Dibromoethane	Comparison to OPOG data	0.05	1.0
Dibromomethane	Comparison to OPOG data	—	1.0
1,2-Dichlorobenzene	Comparison to OPOG data	600[4~~(B)~~]	0.50
1,3-Dichlorobenzene	Comparison to OPOG data	—	1.0
1,4-Dichlorobenzene	Comparison to OPOG data	5	1.0
Dichlorodifluoromethane (Freon 12)	Comparison to OPOG data	1,000[5~~(C)~~]	5.0
1,1-Dichloroethane	Comparison to OPOG data	5	0.50
1,2-Dichloroethane	Comparison to OPOG data	0.5	0.50
1,1-Dichloroethene	Comparison to OPOG data	6	0.50
cis-1,2-Dichloroethene	Comparison to OPOG data	6	0.50
trans-1,2-Dichloroethene	Comparison to OPOG data	10	0.50
1,2-Dichloropropane	Comparison to OPOG data	5	1.0
1,3-Dichloropropane	Comparison to OPOG data	—	1.0
2,2-Dichloropropane	Comparison to OPOG data	—	0.50
1,1-Dichloropropene	Comparison to OPOG data	—	1.0
cis-1,3-Dichloropropene	Comparison to OPOG data	0.5	0.50

TABLE A-1c
Data Uses and Needs – GroundWwater

Parameter	Data Use	Regulatory Limit/ Action Level (µg/L)[1]	Laboratory Target Reporting Limit (µg/L)[2]
trans-1,3-Dichloropropene	Comparison to OPOG data	0.5	0.50
Ethylbenzene	Comparison to OPOG data	700	1.0
Hexachlorobutadiene	Comparison to OPOG data	—	1.0
Isopropylbenzene	Comparison to OPOG data	—	1.0
p-Isopropyltoluene	Comparison to OPOG data	—	1.0
Methylene chloride	Comparison to OPOG data	5	10
Methyl tert-butyl ether	Comparison to OPOG data	13	10
Naphthalene	Comparison to OPOG data	—	1.0
n-Propylbenzene	Comparison to OPOG data	—	1.0
Styrene	Comparison to OPOG data	100	1.0
1,1,1,2-Tetrachloroethane	Comparison to OPOG data	—	1.0
1,1,2,2-Tetrachloroethane	Comparison to OPOG data	1	1.0
Tetrachloroethene	Comparison to OPOG data	5	0.50
Toluene	Comparison to OPOG data	150	0.50
1,2,3-Trichlorobenzene	Comparison to OPOG data	—	1.0
1,2,4-Trichlorobenzene	Comparison to OPOG data	70	1.0
1,1,1-Trichloroethane	Comparison to OPOG data	200	0.50
1,1,2-Trichloroethane	Comparison to OPOG data	5	0.50
Trichloroethene	Comparison to OPOG data	5	0.50
Trichlorofluoromethane (Freon 11)	Comparison to OPOG data	150	0.50
1,2,3-Trichloropropane	Comparison to OPOG data	—	1.0
Trichlorotrifluoroethane (Freon 113)	Comparison to OPOG data	1,200	5.0
1,2,4-Trimethylbenzene	Comparison to OPOG data	—	1.0
1,3,5-Trimethylbenzene	Comparison to OPOG data	—	1.0
Vinyl chloride	Comparison to OPOG data	0.5	0.50
o-Xylene	Comparison to OPOG data	1,750[4] ~~(B)~~	1.0
m,p-Xylenes	Comparison to OPOG data	1,750[4] ~~(B)~~	1.0

ParameterCAM Metals ~~(Equipment Rinsate Blanks)~~	Data Use	Regulatory Limit/ Action Level (mg/L)[1] ~~(mg/L)~~	Laboratory Target Reporting Limit (mg//L)[2] ~~(mg/L)~~
CAM Metals			
Antimony	Comparison to OPOG data	0.006	0.05
Arsenic – Method 6020	Comparison to OPOG data	0.05	0.001
Barium	Comparison to OPOG data	1	0.005
Beryllium	Comparison to OPOG data	0.004	0.005
Cadmium	Comparison to OPOG data	0.005	0.007

ParameterCAM Metals (Equipment Rinsate Blanks)	Data Use	Regulatory Limit/ Action Level (mg/L)[1] (mg/L)	Laboratory Target Reporting Limit (mg//L)[2] (mg/L)
Chromium	Comparison to OPOG data	0.05	0.01
Cobalt	Comparison to OPOG data	—	0.006
Copper	Comparison to OPOG data	1.3[6] (D)	0.01
Lead	Comparison to OPOG data	0.015[6] (D)	0.025
Mercury – Method 7470A	Comparison to OPOG data	0.002	0.001
Molybdenum	Comparison to OPOG data	—	0.015
Nickel	Comparison to OPOG data	0.1	0.01
Selenium	Comparison to OPOG data	0.05	0.03
Silver	Comparison to OPOG data	—	0.01
Thallium	Comparison to OPOG data	0.002	0.08
Vanadium	Comparison to OPOG data	0.05[5] (C)	0.01
Zinc	Comparison to OPOG data	—	0.01

Parameter	Data Use	Regulatory Limit/ Action Level (µg/L)[11]	Laboratory Target Reporting Limit (µg/L)[22]
Semi-volatile Organic Compounds (Equipment Rinsate Blanks)			
SVOCs: Base/Neutral Extractables			
1,2,4-Trichlorobenzene	Comparison to OPOG data	70[7,4]	10
1,2-Dichlorobenzene	Comparison to OPOG data	600[7,4]	10
1,3-Dichlorobenzene	Comparison to OPOG data	5.5	10
1,4-Dichlorobenzene	Comparison to OPOG data	5[7,4]	10
2,4-Dinitrotoluene	Comparison to OPOG data	73	10
2,6-Dinitrotoluene	Comparison to OPOG data	36	10
2-Chloronaphthalene	Comparison to OPOG data	487	10
2-Methylnaphthalene	Comparison to OPOG data	—	10
2-Nitroaniline	Comparison to OPOG data	2.1	50
3-Nitroaniline	Comparison to OPOG data	—	50
3,3'-Dichlorobenzidine	Comparison to OPOG data	0.15	20
4-Bromophenyl phenyl ether	Comparison to OPOG data	—	10
4-Chloroaniline	Comparison to OPOG data	146	20
4-Chlorophenyl phenyl ether	Comparison to OPOG data	—	10
4-Nitroaniline	Comparison to OPOG data	—	50
Acenaphthylene	Comparison to OPOG data	—	10
Acenaphthene	Comparison to OPOG data	365	10
Anthracene	Comparison to OPOG data	1,825	10
Benz(a)anthracene	Comparison to OPOG data	0.09	10
Benzo(a)pyrene	Comparison to OPOG data	0.2[7,4]	10
Benzo(b)fluoranthene	Comparison to OPOG data	0.09	10
Benzo(g,h,I)perylene	Comparison to OPOG data	—	10

Parameter	Data Use	Regulatory Limit/ Action Level (µg/L)[14]	Laboratory Target Reporting Limit (µg/L)[22]
Benzyl alcohol	Comparison to OPOG data	10,950	20
Bis(2-chloroethoxy)methane	Comparison to OPOG data	—	10
Bis(2-chloroethyl)ether	Comparison to OPOG data	0.01	10
Bis(2-chloroisopropyl)ether	Comparison to OPOG data	0.27	10
Bis(2-ethylhexyl)phthalate	Comparison to OPOG data	4.8	10
Butyl benzylphthalate	Comparison to OPOG data	7,299	10
Chrysene	Comparison to OPOG data	9.2	10
Di-n-butylphthalate	Comparison to OPOG data	3,649	10
Di-n-octylphthalate	Comparison to OPOG data	730	10
Dibenz(a,h)anthracene	Comparison to OPOG data	0.009	10
Dibenzofuran	Comparison to OPOG data	24	10
Diethyl phthalate	Comparison to OPOG data	29,200	10
Dimethyl phthalate	Comparison to OPOG data	364,866	10
Fluoranthene	Comparison to OPOG data	1,459	10
Fluorene	Comparison to OPOG data	243	10
Hexachlorobenzene	Comparison to OPOG data	1[7,4]	10
Hexachlorobutadiene	Comparison to OPOG data	0.86	10
Hexachlorocyclopentadiene	Comparison to OPOG data	50[7,4]	10
Hexachloroethane	Comparison to OPOG data	4.8	10
Indeno)1,2,3-cd)pyrene	Comparison to OPOG data	0.09	10
Isophorone	Comparison to OPOG data	70.8	10
n-Nitrosodiphenylamine	Comparison to OPOG data	13.7	10
n-Nitrosodi-n-propylamine	Comparison to OPOG data	0.01	10
Naphthalene	Comparison to OPOG data	6.2	10
Nitrobenzene	Comparison to OPOG data	3.4	10
Phenanthrene	Comparison to OPOG data	—	10
Pyrene	Comparison to OPOG data	182	10
SVOCs: Acid Extractables			
2,4,5-Trichlorophenol	Comparison to OPOG data	3,650	50
2,4,6-Trichlorophenol	Comparison to OPOG data	6.1	10
2,4-Dichlorophenol	Comparison to OPOG data	110	10
2,4-Dimethylphenol	Comparison to OPOG data	730	10
2,4-Dinitrophenol	Comparison to OPOG data	73	50
2-Chlorophenol	Comparison to OPOG data	30	10
2-Methylphenol	Comparison to OPOG data	1,825	10
2-Nitrophenol	Comparison to OPOG data	—	10
4,6-Dinitro-2-methylphenol	Comparison to OPOG data	—	50
4-Chloro-3-methylphenol	Comparison to OPOG data	—	20
4-Methylphenol	Comparison to OPOG data	182	10
4-Nitrophenol	Comparison to OPOG data	292	50

Parameter	Data Use	Regulatory Limit/ Action Level (µg/L)[14]	Laboratory Target Reporting Limit (µg/L)[22]
Benzoic Acid	Comparison to OPOG data	145,978	50
Pentachlorophenol	Comparison to OPOG data	1[7] ~~(a)~~	50
Phenol	Comparison to OPOG data	21,899	10
Pesticides and Polychlorinated Biphenyls ~~(Equipment Rinsate Blanks)~~			
Organochlorine Pesticides – 8081A			
α-BHC	Comparison to OPOG data	0.01[8] ~~(a)~~	0.35
β-BHC	Comparison to OPOG data	0.04[8] ~~(a)~~	0.23
δ-BHC	Comparison to OPOG data	—	0.24
γ-BHC (Lindane)	Comparison to OPOG data	0.2	0.25
α-Chlordane	Comparison to OPOG data	0.1	0.80
γ-Chlordane	Comparison to OPOG data	0.1	0.37
4,4'-DDD	Comparison to OPOG data	0.28[8] ~~4~~	0.50
4,4'-DDE	Comparison to OPOG data	0.20-[8] ~~4~~	0.58
4,4'-DDT	Comparison to OPOG data	0.20-[8] ~~4~~	0.81
Aldrin	Comparison to OPOG data	0.004-[8] ~~4~~	0.34
Dieldrin	Comparison to OPOG data	0.004[8] ~~4~~	0.44
Endosulfan I	Comparison to OPOG data	219[8] ~~4~~	0.30
Endosulfan II	Comparison to OPOG data	219[8] ~~4~~	0.40
Endosulfan Sulfate	Comparison to OPOG data	—	0.35
Endrin	Comparison to OPOG data	2.0	0.39
Endrin Aldehyde	Comparison to OPOG data	—	0.50
Heptachlor	Comparison to OPOG data	0.01	0.40
Heptachlor Epoxide	Comparison to OPOG data	0.01	0.32
Methoxychlor	Comparison to OPOG data	40	0.86
Toxaphene	Comparison to OPOG data	3.0	0.50
Polychlorinated Biphenyls – 8082			
PCB-1016	Comparison to OPOG data	0.5	1.0
PCB-1221	Comparison to OPOG data	0.5	1.0
PCB-1232	Comparison to OPOG data	0.5	1.0
PCB-1242	Comparison to OPOG data	0.5	1.0
PCB-1248	Comparison to OPOG data	0.5	1.0
PCB-1254	Comparison to OPOG data	0.5	1.0
PCB-1260	Comparison to OPOG data	0.5	1.0

Notes:
[1] California primary Maximum Contaminant Level (MCL), ~~unless otherwise noted.~~ For semi-volatile organic compounds - EPA Region 9 Preliminary Remediation Goals (PRGs) for tap water, unless otherwise noted.
[2] Reporting Limits (RLs) shown are for samples that have not been diluted. RLs are matrix dependent and may be higher or lower than listed.
[3] Trihalomethanes~~(A) Trihalomethanes~~
~~(B) Single Isomer or sum of isomers~~
~~(C) California Action Level~~
~~(D) California Lead and Copper Rule~~

[4] Single isomer or sum of isomers
[5] California action level
[6] California lead and copper rule
[7] Semi-volatile organic compounds regulated by California MCLs
[8] Pesticides and PCBs regulated by EPA Region IX PRG for tap water

Table A-2
Measurement Performance Criteria
Omega Chemical Superfund Site, California

Parameter [a]	Method [b]	Reporting Limit/Target Detection Limit (µg/L)	Analytical Accuracy (% Recovery)	Analytical Precision (Relative % Deviation)	Overall Completeness (%)
Soil and Water:					
Volatile Organics [a]	CLP [b]	c	CLP	CLP	90
Semivolatile Organics [a]	CLP	c	CLP	CLP	90
Pesticides and polychlorinated biphenyls [a]	CLP	c	CLP	CLP	90
Metals[a]	CLP	c	CLP	CLP	90
Soil Gas:					
Volatile Organics	EPA TO14	c	70-140	±30	90

[a]Target analytes per Table A-1a to A-1c list.

[b]CLP method per EPA Contract Laboratory Statement of Work

The analyses for volatiles, semivolatiles, pesticides/polychlorinated biphenyls, and metals will be per EPA Contract Laboratory Program (CLP) methodology and laboratories. As required detection limits and the analyte lists differ from the standard CLP lists, the analyses will be carried out per special services provisions currently available under the CLP. Low level ICP/MS statement of work, ILM 5.1, will be used for metals. Similarly low level organic statement of work (OLC 3.2) or larger sample volumes may be used to attain lower level organic detection limits. If CLP is unavailable, the analyses can be carried out at the EPA Regional laboratory using the laboratory's standard operating procedures and quality assurance equivalent to CLP.

[c]Required detection are listed in Table A-1a to A-1c.

Figure A-1 Project Organization

SCO Graphics PC Archive/183120/PP.01/WA174 ProjectOrgChart rev0.PPT

Figure A-2 Data Users/Recipients

SCO Graphics PC Archive/183120/PP.01/WA174 DataUsersChart rev0.PPT

Figure A-3 *Site Map*

Section B
Measurement Data Acquisition

This section presents sampling process design and requirements for sampling methods, sample handling and custody, analytical methods, quality control, and instrumentation for the sampling activities that will be conducted as a part of the Remedial Investigation/ Feasibility Study at Omega Chemical Superfund site. Data acquisition requirements and data management for these sampling events are also addressed in this section.

B.1 Sampling Process Design

B.1.1 Background

Background information and objectives are presented in Section A. The objective of the sampling is to obtain split samples for evaluation of the OPOG data.

B.1.2 Schedule of Analyses

The field investigation is expected to last approximately 3 weeks after mobilization, the split sampling will be spread over this time frame.

B.1.3 Rationale for Sampling Design

Sampling Locations

CH2M HILL will collect splits of OPOG's samples at sampling locations selected by OPOG and approved by EPA ~~Split samples will be collected at OPOG sampling locations per EPA-approved OPOG's SAP~~ (CDM, 2003). Split samples will be collected for all media, soil, water and air. ~~Split sample locations~~The OPOG samples for which splits will be collected will be selected at the time of sampling.

Number of Samples

A minimum of 10 percent splits will be obtained for each media. For soils this percentage has been increased to 20 percent as the total number of samples results in only two samples for 10 percent. Given the expected heterogeneity of the soils, for more comprehensive comparability of the split sample data a higher number of samples (four) has been selected.

Laboratory Analyses

Samples will be analyzed at the EPA Contract Laboratory Program (CLP) laboratories per methodology detailed in Table A-2, and Section B-4.

The analytical parameters for the individual samples are detailed in Table A-2 as well as the accompanying FSP in the request for analyses tables.

B.2 Sampling Methods Requirements

Sampling method requirements have been detailed in the associated FSP in Section 5.

B.3 Sample Handling and Custody Requirements

A sample is physical evidence collected from a hazardous waste site, from the immediate environment, or from another source. Because of the potential evidentiary nature of samples, the possession of samples must be traceable from the time the samples are collected until they are introduced as evidence. In addition to field notebooks, there are a number of documents for tracking sample custody.

Field documents, including sample custody seals, chain-of-custody (COC) records, and packing lists, will be obtained from the Regional Sample Control Center (RSCC) in ~~EPA's QAO~~ Region 9 Laboratory ; this will be preceded with the RSCC request form. COC procedures will be used to maintain and document sample collection and possession. After sample packaging, the following one or more of the COC paperwork forms will be completed, as necessary, for the appropriate samples:

- Organic traffic report and chain-of-custody record
- Inorganic traffic report and chain-of-custody record
- EPA Region IX Chain-of-Custody Record
- Overnight shipping courier air bill

Copies of the above forms will be filled out and distributed per instructions for sample shipping and documentation in Appendix B of the FSP (CH2M HILL, 2003)~~C~~. Completed field quality assurance/quality control (QA/QC) summary forms will be sent to the RSCC at EPA's Region IX Quality Assurance Office at the conclusion of each sampling event.

B.3.1 Chain-of-Custody

Because samples collected during any investigation could be used as evidence, their possession must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. COC procedures are followed to document sample possession.

B.3.1.1 Definition of Custody

A sample is under custody if one or more of the following criteria are met:

- It is in your possession
- It is in your view, after being in your possession
- It was in your possession and then you locked it up to prevent tampering
- It is in a designated secure area

B.3.1.2 Field Custody

In collecting samples for evidence, only enough to provide a good representation of the media being sampled will be collected. To the extent possible, the quantity and types of samples and sample locations are determined before the actual fieldwork. As few people as possible should handle samples.

The field sampler is personally responsible for the care and custody of the samples collected until they are transferred or dispatched properly.

The SM determines whether proper custody procedures were followed during the field work, and decides if additional samples are required.

B.3.1.3 Transfer of Custody and Shipment

Samples are accompanied by a COC record. When transferring samples, the individuals relinquishing and receiving sign, date, and note the time on the record. This record documents custody transfer from the sampler, often through another person, to the analyst at the laboratory.

Samples are packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate COC record accompanying each shipping container (one for each field laboratory, and one for samples driven to the laboratory). Shipping containers will be sealed with custody seals for shipment to the laboratory. Courier names, and other pertinent information, are entered in the "Received by" section of the COC record.

Whenever samples are split with a facility owner or agency, it is noted in the remarks section of the COC record. The note indicates with whom the samples are being split, and is signed by both the sampler and recipient. If the split is refused, this will be noted and signed by both parties. If a representative is unavailable or refuses to sign, this is noted in the remarks section of the COC record. When appropriate, as in the case where the representative is unavailable, the COC record should contain a statement that the samples were delivered to the designated location at the designated time.

All shipments are accompanied by the COC record identifying its contents. The original record and yellow copy accompanies the shipment to the laboratory, and the pink copy is sent to be retained by the SM.

If sent by mail, the package is registered with return requested. If sent by common carrier, a bill of lading is used. Freight bills, postal service receipts, and bills of lading are retained as part of the permanent documentation.

B.3.1.4 Laboratory Custody Procedures

A designated sample custodian accepts custody of the shipped samples, and verifies that the packing list sample numbers match those on the COC records. Pertinent information as to shipment, pickup, and courier is entered in the "Remarks" section. The custodian then enters the sample numbers into a bound notebook, which is arranged by project code and station number.

The laboratory custodian uses the sample identification number or assigns a unique laboratory number to each sample, and is responsible for seeing that all samples are transferred to the proper analyst or stored in the appropriate secure area.

The custodian distributes samples to the appropriate analysts. Laboratory personnel are responsible for the care and custody of samples from the time they are received, until the sample is exhausted or returned to the custodian. The data from sample analyses are recorded on the laboratory report form.

When sample analyses and necessary QA checks have been completed in the laboratory, the unused portion of the sample will be disposed of properly. All identifying stickers, data sheets, and laboratory records are retained as part of the documentation. Sample containers and remaining samples are disposed of in compliance with all federal, state, and local regulatory requirements.

B.3.2 Custody Seals

When samples are shipped to the laboratory, they must be placed in containers sealed with custody seals. One or more custody seals must be placed on each side of the shipping container (cooler).

B.3.3 Field Notebooks

Typical field information to be entered in the field notebook is included in the companion FSP (CH2M HILL, 2003; Section ~~8.1.1~~5.4.3.1). In addition to COC records, a bound field notebook must be maintained by each sampling team leader to provide a daily record of significant events, observations, and measurements during field investigations. All entries should be signed and dated. It should be kept as a permanent record.

These notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project, and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence.

B.3.4 Corrections to Documentation

All original data recorded in field notebooks, sample identification tags, COC records, and receipts-for-sample forms will be written with waterproof ink, unless prohibited by weather conditions. None of these accountable serialized documents are to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on an accountable document assigned to one team, the team leader may make corrections simply by drawing a single line through the error and entering the correct information. The erroneous information should not be obliterated. Any subsequent error discovered on an accountable document should be corrected by the person who made the entry. All subsequent corrections must be initialed and dated.

B.4 Analytical Methods Requirements

Project analytes, methods and required detection levels have been listed in Table A-2.

The soil and water analyses for volatiles, semivolatiles, pesticides/polychlorinated biphenyls and metals will be per EPA CLP methodology and laboratories. As required detection limits and the analyte lists differ form the standard CLP lists the analyses will be carried out per special services provisions currently available under the CLP. Low level ICP/MS statement of work, ILM 5.1, will be used for metals. Similarly low level organic statement of work (OLC 3.2) or larger sample volumes may be used to attain lower level organic detection limits. Volatile organic compounds in soil will be collected and preserved

following EPA Method 5035 by the OPOG for both splits. If CLP is unavailable the analyses can be carried out at the EPA Regional laboratory using the laboratories standard operating procedures and quality assurance equivalent to CLP.

B.5 Quality Control Requirements

B.5.1 Field QC Procedures

QC requirements related to the sample collection process (i.e., design, methods, handling, and custody) requirements have been discussed in the previous sections of this document.

Field QC samples include field duplicates, field blanks, and laboratory QC samples (for MS/MSDs). QC samples will be collected immediately following collection of target samples, and using the same procedures as the collection of the target sample. These procedures are presented in the FSP. Field blank samples are not needed for the split samples as the sampling will be carried out by the OPOGs. Trip blanks will be included with the split oversight volatile organics samples. As ~~the~~ OPOG will be collecting the samples, field blanks will be included with the OPOG samples.

B.5.2 Laboratory Procedures

Laboratory QC procedures will include the following:

- Analytical methodology according to specific methods listed in Table A-2.
- Instrument calibrations and standards as defined in specific methods listed in the CLP statement of work, ~~and~~ [redacted]
- Laboratory blank measurements per CLP statement of work, ~~and~~ [redacted] ~~at a minimum 5 percent or 1 per batch frequency~~
- Accuracy and precision measurements per CLP statement of work, ~~and~~ [redacted], at a minimum of 1 in 20, 1 per batch.
- Data reduction and reporting according to specific methods listed in Table A-2.
- Laboratory documentation equivalent to the CLP statement of work.

B.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Instrument maintenance logbooks are maintained in laboratories at all times. The logbooks, in general, contain a schedule of maintenance, as well as a complete history of past maintenance, both routine and nonroutine.

Preventive maintenance is performed according to the procedures described in the manufacturer's instrument manuals, including lubrication, source cleaning, detector cleaning, and the frequency of such maintenance. Chromatographic carrier gas-purification traps, injector liners, and injector septa are cleaned or replaced on a regular basis. Precision

and accuracy data are examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance will be performed when an instrument begins to degrade as evidenced by the degradation of peak resolution, shift in calibration curves, decrease in sensitivity, or failure to meet one or another of the QC criteria.

Instrument downtime is minimized by keeping adequate supplies of all expendable items, where expendable means an expected lifetime of less than 1 year. These items include gas tanks, gasoline filters, syringes, septa, gas chromatography (GC) columns and packing, ferrules, printer paper and ribbons, pump oil, jet separators, open-split interfaces, and mass spectroscopy filaments.

Preventive maintenance for field equipment (e.g., pH meter) will be carried out in accordance with procedures and schedules outlined in the particular model's operation and maintenance handbook.

B.7 Instrument Calibration and Frequency

The following subsections review instrument calibration and frequency information.

B.7.1 Field Calibration Procedures

For water analyses, field equipment requiring calibration includes: pH, EC, temperature, dissolved oxygen and oxidation/reduction potential meters. These meters will be calibrated before the start of work and at the end of the sampling day. Any instrument "drift" from prior calibration should be recorded in a field notebook. Calibration will be in accordance with procedures and schedules outlined in the particular instrument's operations and maintenance manual.

Calibrated equipment will be uniquely identified by using either the manufacturer's serial number or other means. A label with the identification number and the date when the next calibration is due will be physically attached to the equipment. If this is not possible, records traceable to the equipment will be readily available for reference. In addition, the results of calibrations and records of repairs will be recorded in a logbook.

Scheduled periodic calibration of testing equipment does not relieve field personnel of the responsibility of employing properly functioning equipment. If an individual suspects an equipment malfunction, the device must be removed from service, tagged so that it is not inadvertently used, and the appropriate personnel notified so that a recalibration can be performed, or a substitute piece of equipment can be obtained.

Equipment that fails calibration or becomes inoperable during use will be removed from service and either segregated to prevent inadvertent use, or tagged to indicate it is out of calibration. Such equipment will be repaired and satisfactorily recalibrated. Equipment that cannot be repaired will be replaced.

Results of activities performed using equipment that has failed recalibration will be evaluated. If the activity results are adversely affected, the results of the evaluation will be documented and the task manager and quality assurance/quality control (QA/QC) reviewer will be notified.

B.7.2 Laboratory Calibration Procedures

Laboratory calibration procedures are specified in the referenced methods for all parameters listed in Table A-2.

B.8 Data Acquisition Requirements (Nondirect Measurements)

Previously collected data and other information will be used to assist decisionmaking during the RI/FS. These data will be in both hard copy and electronic format. Electronic data will be handled by the electronic data management system described below.

B.9 Data Management

All data for all parameters will undergo two levels of review and validation: 1) at the laboratory, and 2) outside the laboratory as described in Section D. Following receipt of validated data, it will be input into the project database to facilitate database inquires and report preparation. The data will be stored in the databases with all laboratory qualifiers included. Established data queries and formats developed during the previous work assignments (WA) will be adapted for incorporation of laboratory data from ASCII files, provided by EPA's QAO, to files compatible with the project database. The database will be maintained in a manner that is compatible with, and provided to, EPA, or others, at EPA's request. Major components for complete data management will be as follows:

- **Data Conversion/Manipulation/Review.** Reports of data from sampling are received from the QAO in hardcopy or electronic format. These data must be converted, input, reviewed, and QC checked.

  In addition, available data from other sources may be incorporated into the database. These data will need to be manually input, output, reviewed, QC checked, then uploaded into the database.

- **Preparation of Tables.** Data tables will be prepared following receipt of validated data from the QAO following each sample event of the WA. Queries will be created for the database to generate updated tables.

- **Database Documentation.** An update of the database and complete documentation will be performed at the end of the project. The commands, file names, and general operating procedures for all the data queries will be documented as directed by the EPA WAM. This documentation will be provided to EPA and transferred to others (at EPA's request).

Section C
Assessment/Oversight

C.1 Assessment and Response Actions

The review team and the SM will monitor the performance of the QA procedures. If problems arise and the WAM directs the SM, the review team will conduct field audits, currently not scheduled or included in the SOW. Audits may be scheduled to evaluate 1) the execution of sample identification, COC procedures, field notebooks, sampling procedures, and field measurements; 2) whether trained personnel staffed the sample event; 3) whether equipment was in proper working order (i.e., calibration); 4) the availability of proper sampling equipment; 5) whether appropriate sample containers, sample preservatives, and techniques were used; 6) whether sample packaging and shipment were appropriate; and 7) whether QC samples were properly collected.

The analyses are expected to be performed by the EPA CLP laboratories and/or the EPA Regional Laboratory . The distribution of analyses may change at the time of analyses depending on availability. The quality assurance of the of the CLP is centrally managed by the EPA. The quality assurance of the Regional laboratory is managed by the EPA QAO. Laboratories subcontracted to CH2M HILL, if any, will be selected based on prior performance on Regional Superfund projects. Additionally, on-site audits or performance evaluation samples will be administered by the project QAO, as necessary.

Audits will be followed up with an audit report prepared by the reviewer. The auditor will also debrief the laboratory or the field team at the end of the audit and request that the laboratory or field team comply with the corrective action request.

C.1.1 Reporting and Resolution of Issues

If QC audits result in detection of unacceptable conditions or data, the SM will be responsible for developing and initiating corrective action. The WAM will be notified if nonconformance is of program significance or requires special expertise not normally available to the project team. In such cases, the remedial project manager (RPM) will decide whether any corrective action should be pursued. Corrective action may include the following:

- Reanalyzing samples if holding time criteria permit
- Resampling and analyzing
- Evaluating and amending sampling and analytical procedures
- Accepting data acknowledging a level of uncertainty

C.2 Reports to Management

The SM or WAM may request that a QA report be made to the WAM on the performance of sample collection and data quality. The report will include the following:

- Assessment of measurement data accuracy, precision, and completeness
- Results of performance audits
- Results of systems audits
- Significant QA problems and recommended solutions

Monthly progress reports will summarize overall project activities and any problems encountered. QA reports generated on sample collection and data quality will focus on specific problems encountered and solutions implemented. Alternatively, in lieu of a separate QA report, sampling and field measurement data quality information may be summarized and included in the final reports summarizing field activities (e.g., well installation or aquifer testing technical memoranda). The objectives, activities performed, overall results, sampling, and field measurement data quality information of the project will be summarized and included in the final field activities' reports along with any QA reports.

Section D
Data Validation and Usability

D.1 Data Review, Validation, and Verification Requirements

All data for all parameters will undergo two levels of review and validation: 1) at the laboratory, and 2) outside the laboratory by the EPA Quality Assurance Management Section or their designee. ~~100~~ One hundred percent of data will be reviewed outside the laboratory at EPA Region IX Tier 3 level of effort. This level of effort is based on the lower number of samples (only one analytical batch for each method is expected). Because the data will be used to evaluate/validate OPOG's data, a comprehensive review is needed.

D.2 Validation and Verification Methods

Initial data reduction, validation, and reporting at the laboratory will be performed as described in the laboratory standard operating procedures.

Independent data validation by EPA or their designee will follow EPA *Contract Laboratory Program National Functional Guidelines for Inorganic/Organic Data Review* (EPA, February 1994 and 1999) as described above.

The following guidelines may be used in comparing the EPA and the OPOG data:

Guidance for Comparing Split Sample Data

Matrix	Parameter	Disagreement	Major Disagreement
All	All	>5x difference when one result is <DL	>10x difference when one result is <DL
All	All	>3x difference when one result is <RL	>5x difference when one result is <RL
Water	All except POL	>2x difference	>3x difference
Soil	All except Metals, VOCs, BTEX, POL	>4x difference	>5x difference
Soil	Metals	>2x difference	>3x difference
Water & Soil	POL	>3x difference	>5x difference
Soil	VOC, BTEX	>5x difference	>10x difference

<DL: less than estimated Method Detection Limit (i.e., "ND").
<RL: less than Reporting Limit (i.e., "J"-flagged).
POL: chromatographic fuel-range analyses (e.g., 8015 methods)

In case of a major disagreement, ~~first~~ sampling and analytical data will be reviewed to establish the cause of discrepancy first. Subsequently, the deviation will be discussed with ~~the~~ OPOG for relevant corrective actions (re-sampling, re-analyses etc.) or explanations/data qualification as appropriate.

D.3 Reconciliation with Data Quality Objectives

Results obtained from the project will be reconciled with the requirements specified in Table A-2 of this QAPP. Assessment of data for precision, accuracy, and completeness will be per the following quantitative definitions.

D.3.1 Precision

If calculated from duplicate measurements:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2)/2}$$

RPD = relative percent difference
C_1 = larger of the two observed values
C_2 = larger of the two observed values

If calculated from three or more replicates, use relative standard (RSD) rather than relative percent difference (RPD):

$$RSD = (s / \bar{y}) \times 100\%$$

RSD = relative standard deviation
s = standard deviation
$\bar{y}$ = mean of replicate analyses

Standard deviation, s, is defined as follows:

$$S = \sqrt{\frac{\sum_{i=1}^{n} (y_i/y)^{-2}}{n-1}}$$

s = standard deviation
y_i = measured value of the i^{th} replicate
$\bar{y}$ = mean of replicate analyses
n = number of replicates

D.3.2 Accuracy

For measurements where matrix spikes are used:

$$\%R = 100\% \times \left[\frac{S - U}{C_{sa}}\right]$$

%R = percent recovery
S = measured concentration in spiked aliquot
U = measured concentration in unspiked aliquot
C_{sa} = actual concentration of spike added

For situations where a standard reference material (SRM) is used instead of or in addition to matrix spikes:

$$\%R = 100\% \times \left[\frac{C_m}{C_{sm}}\right]$$

%R	=	percent recovery
C_m	=	measured concentration of SRM
C_{sm}	=	actual concentration of SRM

D.3.3 Completeness (Statistical)

Defined as follows for all measurements:

$$\%C = 100\% \times \left[\frac{V}{T}\right]$$

%C	=	percent completeness
V	=	number of measurements judged valid
T	=	total number of measurements

References

U.S. Environmental Protection Agency. ~~1998~~ 2002. *EPA Guidance for Quality Assurance Project Plans.* EPA QA/G5, ~~EPA/600/R-98/018. February~~ EPA/240/R-02/009. December.

U.S. Environmental Protection Agency. 1994 and 2000. *Guidance for the Data Quality Objectives Process.* EPA QA/G4. September.

U.S. Environmental Protection Agency. 1994 and 1999. *Contract Laboratory Program National Functional Guidelines for Inorganic/ Organic Data Review.* February.

U.S. Environmental Protection Agency. ~~1999~~ 2001. ~~*Requirements for Quality Assurance Project Plans.*~~ *EPA Requirements for Quality Assurance Project Plans* (QA/R-5) - March 2001, EPA/240/B-01/003.

Appendix A
Data Quality Objectives

Appendix A
Data Quality Objectives

Contents

A-1 Data Quality Objectives
Soil Gas, Soil, Ambient Air and Groundwater Sampling
Remedial Investigation/Feasibility Study Oversight
Omega Chemical Superfund Site Operable Unit 01

Step 1. State the Problem

(1) *Identify members of the planning team* – The members of the planning team are the Environmental Protection Agency (EPA) Work Assignment Manager (WAM), CH2M HILL Site Manager (SM), CH2M HILL hydrogeologists, and CH2M HILL Quality Assurance Officer.

(2) *Identify the primary decisionmaker* – There will not be a primary decisionmaker. Decisions will be made by consensus.

Develop a concise description of the problem – CH2M HILL will perform oversight of a Remedial Investigation/Feasibility Study conducted by Omega Chemical Site Potentially Responsible Party Organized Group (OPOG).

Existing groundwater and soil data indicate elevated concentrations of VOCs are present the soil and groundwater beneath the former Omega Chemical Facility. A series of soil gas, soil and groundwater investigations have been performed at the site by a variety of consultants beginning in 1985. Chlorinated hydrocarbons (primarily PCE, TCE, 1,1-DCE, cis-1,2-DCE, and chloroform) and Freons (Freon 11 and Freon 113) are the primary chemicals of concern directly beneath the site. Elevated total chromium was reported by Weston (2003) to be present in groundwater beneath the site. These chemicals could potentially have an adverse effect upon human health and the environment.

As part of the OU-1 effort, EPA entered into a Partial Consent Decree with OPOG. This Partial Consent Decree was entered into the District Court on February 23, 2001 and OPOG agreed to perform the following work at the Site:

1) implement an RI/FS for contamination in the vadose zone within what is known as the "Phase 1A area" of the Site;

2) perform an EE/CA addressing groundwater contamination in the Phase 1A area;

3) implement the response action selected in EPA's Action Memorandum at the conclusion of the EE/CA (which is expected to be a groundwater treatment system, e.g. pump and treat, located at the downgradient edge of the Phase 1A area);

4) perform a risk assessment for potential contamination resulting from releases of hazardous substances from the Omega Property within the Phase 1A area; and

5) install up to three groundwater monitoring wells at locations downgradient of the Phase 1A area and upgradient of the City of Santa Fe Springs water supply well 30R3.

As related to the DQOs, the CH2MHILL will perform oversight of OPOG as they:

(e) Collect additional groundwater data (to be collected from existing wells), as well as data from surface and subsurface soil, soil gas, and ambient air samples. These data are needed to update the past assessment of the nature and extent of VOCs contamination.

(f) Perform risk evaluations of contaminated media at the site and their possible impact to receptors.

(g) Perform modeling of the fate and transport of contaminants at the site.

(h) Determine whether remedial action is necessary at the site and possibly perform pilot and/or bench testing.

A summary of the work to be performed relating to sample collection, analysis, and interpretation follows below:

Field Investigation (FI)
CH2M HILL will conduct oversight of the RI/FS field investigation and collect split environmental samples and information required in support of the RI/FS oversight.

Sample Analysis (SN)
CH2M HILL will arrange for a contract laboratory program (CLP) type sample analysis of split environmental samples collected during the previous task.

Analytical Support and Data Validation (AN)
CH2M HILL will perform the validation of the split samples to ensure that adequate and definable sample management and techniques are implemented.

Data Evaluation (DE)
CH2M HILL will organize and evaluate data gathered during the previous tasks. The data evaluation activities will include:

- Data Usability Evaluation and Field QA/QC
- Data Reduction, Tabulation, and Evaluation
- Review of OPOG's Modeling
- Develop Data Evaluation Report

CH2M HILL will review OPOG's hydrogeological modeling and perform modeling simulations, as directed by EPA, to evaluate OPOG's conclusions regarding the fate and transport of contaminants at the site. CH2M HILL will summarize the results of the data evaluation and review OPOG's hydrogeological modeling in a data evaluation report.

Assessment of Risk (RA)
CH2M HILL will review and provide comment on the OPOG's evaluation and assessment of risk to human health and the environment posed by site contaminants. The OPOG's assessment shall:

- Determine if site contaminants pose a current or potential risk to human health and the environment in the absence of any remedial action.

- Address the contaminant identification, exposure assessment, toxicity assessment, and risk characterization.
- Determine if a remedial action is necessary at the site, provide justification for performing remedial action, and determine what exposure pathways need to be removed.

CH2M HILL will review and comment on the OPOG's Human Health Risk Assessment (HHRA) report that addresses the following:

- Hazard Identification (sources)
- Dose-Response Assessment
- Prepare Conceptual Exposure/Pathway Analysis
- Characterization of Site and Potential Receptors
- Exposure Assessment
- Risk Characterization
- Identification of Limitations/Uncertainties
- Site Conceptual Model

CH2M HILL will review and comment on the OPOG's Ecological Risk Assessment (ERA) report that addresses the following:

- Hazard Identification (sources)
- Dose-Response Assessment
- Prepare Conceptual Exposure/Pathway Analysis
- Critical exposure pathways (e.g., surface water)
- Characterization of Site and Potential Receptors
- Select Chemicals, Indicator Species, and End Points
- Exposure Assessment
- Toxicity Assessment/Ecological Effects Assessment
- Risk Characterization
- Identification of Limitations/Uncertainties
- Site Conceptual Model

Treatability Study/Pilot Testing

CH2M HILL will review and comment on treatability studies and/or pilot tests conducted by the OPOG's as directed by EPA to ensure successful completion of the RI/FS and remedy selection process. The review will further ensure that the OPOG clearly states the rational for a treatability study or pilot test in their work plan and that they conduct the treatability study or pilot test in accordance with the Fact Sheet "Guide for Conducting Treatability Studies Under CERCLA," November, 1993.

CH2M HILL will review the OPOG literature search and treatability and pilot work plan.

CH2M HILL will collect split samples for analysis and comparison with the OPOG's data during bench tests, pilot studies, and field tests.

CH2M HILL will review the OPOG's Treatability Study Report and provide comments after receipt of the Treatability Study. The review will focus on the performance of the technology; the test results compared with reported technology performance standards;

treatment technology's effectiveness, implementability, cost, and final results compared with the predicted results; and also an evaluation of a full-scale application of the technology, including a sensitivity analysis identifying the key parameters affecting full-scale operation.

Remedial Investigation Report
CH2M HILL will review the OPOG's Remedial Investigation (RI) report to ensure that the report accurately establishes the site characteristics such as media contaminated, extent of contamination, and the physical boundaries of the contamination.

Step 2. Identify the Decision

(1) *Identify the principal study question* – The principal goal for CH2M HILL is to verify that the following study questions are adequately addressed by OPOG:

(a) What is the current nature and extent of VOC contamination in surface and subsurface soil and soil gas within OU-1?

(b) Do contaminants pose an unacceptable potential risk to human health and the environment?

(c) Are additional source areas present at the site that are currently uncharacterized?

(d) What remedial action will best suit the site conditions defined in this most recent set of sampling analytical results?

(2) *Define alternate actions that could result from resolution of the principal study question* – These actions will be defined by OPOG and reviewed by CH2MHILL.

(3) *Combine the principal study question and the alternative actions into a decision statement* – The decision statement for CH2M HILL is to verify that OPOG generate data sufficient to resolve the three principal questions of the RI/FS and to take appropriate action based on results of the investigation.

(4) *Organize multiple decisions* – Based on the answer to the principal study question, decisions about additional phases of remedial design activities will be made by OPOG and reviewed by CH2MHILL.

Step 3. Identify Inputs to the Decision

- The purpose of this step is to identify the information and measurements needed to support the decision statement. The data will be used for comparison with OPOG's data. Further, OPOG's data will be evaluated with regards to the three principal questions of the RI/FS.

Identify the information that will be required to resolve the decision statement – Subsurface soils and soil gas data are available from previous investigations. The OPOG's RI effort focuses on filling gaps in the available data. Based on data uses and availability, the following data are needed:

- Data that characterize the nature and extent of contamination in surface and subsurface soils and in groundwater.
- Soil gas data from the northwest and northeast boundaries.
- Indoor air from specific on-site and off-site locations.

(1) *Determine the sources for each item of information identified:* Human health risks will be evaluated using data for Site soils and soil gas collected in previous investigations, as well as data for Site soils, soil gas, indoor air, and ambient air resulting from this investigation.

Identify the information that is needed to establish the action level –
Action levels will be generated in the risk assessment using USEPA guidance.

(2) *Confirm that appropriate measurement methods exist to provide the necessary data* – The following methods have been identified to meet project needs (further details provided in Sections A and B~~section s A,B~~ of the QAPP):

Parameter	Method
Volatile Organic Compounds (VOCs)	EPA 8260
Semi-Volatile Organic Compounds (SVOCs)	EPA 8270C
CAM metals-	EPA 6010B/6020/7417A
Pesticides and PCBs	EPA Method 8081A/8082
VOCs-soil gas, air	TO-14
Redox Potential-soil	SM 2580B
Clay Content –soil	ASTM D-422 or D 4464
Organic Carbon-soil	SW-846 9060 Modified
Cation exchange capacity	SW-846 9081
Moisture content	ASTM D2216
Hydraulic Conductivity	ASTM D5084

Step 4. Define the Boundaries for the Study

The Phase 1a area, or OU1, was defined in the Consent Decree as extending from the former Omega Chemical property to 100 feet southwest of Putnam Street. The sample locations and analytical methods were defined in the EPA approved OPOG's Sampling and Analysis Plan (CDM, 2003). ~~The sampling locations are shown in Attachment 1.~~

(1) *Specify the characteristics that define the population of interest* – The samples will be collected following a systematic rather than statistical sampling design.

(2) *Define the spatial boundary of the decision statement* –

(a) Define the geographical area to which the decision statement applies –

All split samples will be collected at selected OPOG's sampling locations.

(3) *Define the temporal boundary of the decision statement* –

(a) Determine the time frame to which the decision statement applies –

The field investigation will begin subsequent to mobilization and will take approximately three weeks.

(b) Determine when to collect data – Data will be collected during the time frame specified in (a).

(4) *Define the scale of decisionmaking* – The scale of decision making will be limited to the Phase 1a area.

(5) *Identify practical constraints on data collection* – The sampling locations and schedule will depend on OPOG's field activities.

Step 5. Develop a Decision Rule

(1) *Specify the statistical parameter that characterizes the population of interest* - Split sample analysis results will be compared to OPOG's analysis results. A factor-difference will be determined for each sampled media and compound.

(2) Specify the action level for the study – Factor-difference action levels will be used.

(3) Develop a decision rule (an "if...then..." statement) –

(a) If factor difference between split and OPOG's analytical results is greater than an action limit to be established, re-sampling by OPOG may be requested as a result.

Step 6. Specify Tolerable Limits on Decision Errors

Tolerable limits on decision errors, which are used to establish performance goals for the data collection design, are specified in this step.

(1) *Determine the range of the parameters of interest* – The available historical range of the parameters of interest is presented in Tables A-1a through ~~A-7~~A-1c in this QAPP. Regulatory action levels for the parameters of interest are summarized in Tables A-1a to A-1c ~~-8A and A-8B~~ in Section A of this QAPP. These values constitute the range of interest for the parameters of interest.

(2) *Identify the decision errors and choose a null hypothesis* – The DQO guidance prescribes the identification of the null hypothesis and associated decision errors for determining the number of random samples and the locations to attain a given level of confidence with the spatial distribution. Because samples will be collected at systematically selected locations, statistical decision errors cannot be defined. However, project error tolerances are defined in terms of precision, accuracy,

representativeness, comparability, and completeness (PARCC) parameters in Section A.4 of this QAPP. Analyte-specific accuracy and precision ranges are shown in Table A-29 of this QAPP. The project completeness goal is set at 90%.

Step 7. Optimize the Design

The Wok Plan was optimized to focus on collection of split and duplicate samples and their analysis.

Review the data quality objective (DQO) outputs and existing data

(1) *Develop general data collection design alternatives* – None anticipated.

(2) *For each data collection design alternative, select the optimal sample size that satisfies the objectives* - None anticipated.

(3) *Select the most resource-effective data collection design that satisfies the DQOs* – The number of split/duplicate samples will be 10% (20% for soil samples) of the field samples collected by OPOG. When 10% of OPOG's samples is less than one, one sample will be collected.

Document the operational details and theoretical assumptions of the selected design in sampling and analysis plan – The data collection program, including sampling rationale, is presented in ~~the FSP in Section 6.0~~Section 3 of the FSP (CH2M HILL, 2003).